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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,260	10/08/2003	David William Abraham	YOR920030013US1	5657

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EXAMINER

MAI, ANH D

ART UNIT PAPER NUMBER

2814

DATE MAILED: 05/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

11-9

Office Action Summary	Application No.		Applicant(s)	
	10/680,260		ABRAHAM ET AL.	
	Examiner		Art Unit	
	Anh D. Mai		2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) 27-31 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>08 Jan 2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I, claims 1-26 in the reply filed on February 28, 2005 is acknowledged.
2. Claims 27-31 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on February 28, 2005.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested:

METHOD OF PATERING A MAGNETIC THIN FILM UTILIZING CHEMICAL
TRANSFORMATION.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1-26 are rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 provides for the use of a chemical transformation, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 2 provides for the use of photolithography, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 7 contains the trademark/trade name "Permalloy". Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or

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trade name. In the present case, the trademark/trade name is used to identify/describe an alloy of magnetic film and, accordingly, the identification/description is indefinite.

Claim 13, recites: "producing a functioning magnetic device".

What is the functioning magnetic device ?

How to form such functioning magnetic device ?

The claim recites "producing" a device without a clear process steps, thus, claim 13 is indefinite.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-11, 13-15, 17, 19 and 22-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Kamata et al. (U.S. Patent No. 6,841,224).

With respect to claim 1, as best understood by the examiner, Kamata teaches method of patterning a magnetic thin film as claimed including:

using a chemical transformation of a portion of the magnetic thin film (20) to transform the portion to be non-magnetic and electrically insulating (40). (See Figs. 3A-B).

With respect to claim 2, the method of Kamata further includes: using photolithography to provide a mask (30) over the portion of the magnetic thin film (20) to be preserved.

With respect to claim 3, the method of Kamata further includes: converting the portion of the magnetic thin film (20) by a reactive plasma.

With respect to claim 4, using the chemical transformation of Kamata includes using a fluorine-based reactive plasma.

With respect to claim 5, the fluorine-based reactive plasma of Kamata cCF_4 , SF_6 , CHF_3 .

With respect to claim 6, the pressure used in the converting of Kamata is within a range of about 10 mT to about 30 mT.

With respect to claim 7, the portion of the magnetic thin film (20) of Kamata comprises any of alloys of nickel, iron, and cobalt, and the converting comprising converting the alloys of nickel, iron, and cobalt, to a fluorine-containing film.

With respect to claim 8, the fluorine-containing film (40) is non-ferromagnetic.

With respect to claim 9, the fluorine-containing film (40) of Kamata is non-magnetic.

With respect to claim 10, the fluorine-containing film (40) of Kamata is electrically insulating.

With respect to claim 11, the mask (30) of Kamata comprises a photoresist.

With respect to claim 13, the method of Kamata further includes: producing a functioning magnetic device.

With respect to claim 14, the using chemical transformation of Kamata can be performed at room temperature.

With respect to claim 15, the reactive plasma of Kamata includes a fluorocarbon.

With respect to claim 17, the reactive plasma of Kamata includes sulfur hexafluoride.

With respect to claim 19, the pressure of Kamata is selectively employed for the plasma sputtering such that the magnetic thin film material (20) is substantially free of erosion.

With respect to claim 22, the mask of Kamata comprises an insulating hard mask (360), the method of Kamata further includes: after the converting, selectively etching the insulating hard mask (360) to pattern the insulating hard mask.

Regarding the term insulating hard mask, the photoresist material (360) of Kamata is considering an insulating hard mask since there is no specific insulating material is required.

With respect to claim 23, the method of Kamata further includes: forming a conductive material (380) over the area where the insulating hard mask (360) was etched.

With respect to claim 24, the reactive plasma of Kamata includes a fluorine-containing gas.

With respect to claim 25, the magnetic thin film (20) of Kamata includes a magnetic tunnel junction (MTJ), and wherein after the converting portion, the edges of the magnetic tunnel junction have no exposure to oxygen. (see Figs 13).

With respect to claim 26, the edge smoothness of the MTJ of Kamata is inherently determined by a line edge roughness of the mask (360).

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7. Claims 1-3, 11-14 and 19-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Grynkewich et al. (U.S. Patent No. 6,881,351).

With respect to claim 1, as best understood by the examiner, Grynkewich teaches method of patterning a magnetic thin film as claimed including:

using a chemical transformation of a portion of the magnetic thin film (24) to transform the portion to be non-magnetic and electrically insulating (30). (See Fig. 2).

With respect to claim 2, the method of Grynkewich further includes: using photolithography to provide a mask (28) over the portion of the magnetic thin film (24) to be preserved.

With respect to claim 3, the method of Grynkewich further includes: converting the portion of the magnetic thin film (24) by a reactive plasma.

With respect to claim 11, the mask (28) of Grynkewich is provide on the magnetic thin film utilizing a well known techniques to form a mask, hence comprises a photoresist.

With respect to claim 12, the mask of Grynkewich comprises a hard mask patterned layer (26/28) comprising one of TaN.

With respect to claim 13, the method of Grynkewich further includes: producing a functioning magnetic device.

With respect to claim 14, the using chemical transformation of Grynkewich can be performed at room temperature.

With respect to claim 19, the pressure of Grynkewich is selectively employed for the plasma sputtering such that the magnetic thin film material (24) is substantially free of erosion.

With respect to claim 20, the method of Grynkewich further includes:

forming an insulating layer (36) over the converted portion (30) of the magnetic thin film (24) and the mask (28); and

etching the insulating layer (38) and the mask (28) to planarize the upper level of the mask (28) and the insulating layer (38). (See Figs. 3-6).

With respect to claim 21, the method of Grynkewich further includes:

selectively etching the mask (28); and

forming a conductive material (42) over the insulating layer (38) and an area where the mask (28) was selectively etched.

With respect to claim 22, the mask of Grynkewich comprises an insulating hard mask (28), the method of Grynkewich further includes: after the converting, selectively etching the insulating hard mask (28) to pattern the insulating hard mask.

Regarding the term insulating hard mask, the mask (28) of Grynkewich is considering an insulating hard mask since there is no specific insulating material is required.

With respect to claim 23, the method of Grynkewich further includes: forming a conductive material (42) over the area where the insulating hard mask (28) was etched.

With respect to claim 24, the reactive plasma of Grynkewich includes a O₂.

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With respect to claim 25, the magnetic thin film (24) of Grynkewich includes a magnetic tunnel junction (MTJ), and wherein after the converting portion (30), the edges of the magnetic tunnel junction (32) have no exposure to oxygen.

With respect to claim 26, the edge smoothness of the MTJ of Grynkewich is inherently determined by a line edge roughness of the mask (28).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 12, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata '224 as applied to claims 2 and 3 above, and further in view of Grynkewich et al. (U.S. Patent No. 6,881,351).

With respect to claim 12, Kamata is shown to teach all the features of the claim with the exception of utilizing a metal hard mask.

However, Grynkewich teaches utilizing photolithography to provide a mask including TaN (26).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to provide a hard mask of Kamata including a TaN masking layer protect a certain portion of the magnetic thin film from converting.

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With respect to claim 20, Kamata teaches a method of chemical transformation converting a portion of magnetic thin film by reactive plasma.

Thus, Kamata is shown to teach all the features of the claim with the exception of further process step.

However, Grynkewich teaches process steps following the conversion including:

forming an insulating layer (36) over the converted portion (30) of the magnetic thin film (24) and the mask (28); and

etching the insulating layer (36) and the mask (28) to planarize the upper level of the mask (28) and the insulating layer (36). (See Figs. 1-6).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to further process the converted magnetic thin film of Kamata utilizing the process step as taught by Grynkewich to complete the magnetic device.

With respect to claim 21, the method of Kamata, further includes:

selectively etching the mask (360); and forming a conductive material (380) over the insulating layer and the area where the mask (380) was selectively etched. (See Fig. 13C).

9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata or Grynkewich as applied to claim 3 above, and further in view of Klemmer et al. (U.S. Patent No. 6,849,349).

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Kamata or Grynkewich teaches converting a portion of a magnetic thin film by a reactive plasma.

Thus, Kamata or Grynkewich is shown to teach all the features of the claim with the exception of using argon for the reactive plasma.

However, Klemmer teaches: other species such as argon can be used to convert a portion of a magnetic thin film (14) in to non-magnetic (14b). (See Fig. 2).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to convert a portion of the magnetic thin film of Kamata or Grynkewich utilizing argon as taught by Klemmer to convert the magnetic material into non-magnetic material without removing the converted portion, such portion can be used for insulation.

10. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata '224.

Kamata teaches converting a portion of the magnetic thin film (20) into non-magnetic insulating (40).

Thus, Kamata is shown to teach all the features of the claim with the exception of explicitly to include bromide.

However, Kamata teaches the reactive gas containing halogen. It is well known that bromide in a halogen gas.

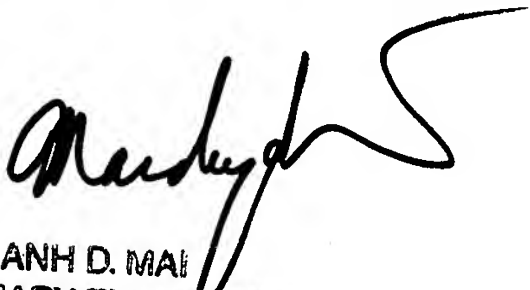
Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to converting a portion of the magnetic thin film of Kamata utilizing bromide, since bromide as well as iodide, fluoride or chloride are member of reactive gas known halogen.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 9:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



ANH D. MAI
PRIMARY EXAMINER

May 16, 2005